

(19) Europäisches Patentamt  
European Patent Office  
Office européen des brevets



(11) EP 0 602 055 B1

(12)

## EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention  
of the grant of the patent:

01.05.1996 Bulletin 1996/18

(21) Application number: 92916417.6

(22) Date of filing: 04.08.1992

(51) Int Cl. 6: E04C 3/34, E04C 3/29

(86) International application number:  
PCT/CA92/00325

(87) International publication number:  
WO 93/03236 (18.02.1993 Gazette 1993/05)

### (54) BUILDING STRUCTURE

BAUSTRUKTUR

ELEMENT DE CONSTRUCTION

(84) Designated Contracting States:  
DE ES GB IT

(30) Priority: 05.08.1991 US 740440

(43) Date of publication of application:  
22.06.1994 Bulletin 1994/25

(73) Proprietor: DCA ARCHITECTURAL PRODUCTS  
LTD.  
West Vancouver, British Columbia V7T 1P1 (CA)

(72) Inventors:  
• GAMEL, Chris  
West Vancouver, British Columbia V7T 1P1 (CA)

• RAMSAY, Dana  
North Vancouver, British Columbia V7R 3R (CA)  
• BURDETT, Alan  
North Vancouver, British Columbia V7N 1H (CA)

(74) Representative: Abitz, Walter, Dr.-Ing.  
Patentanwälte Abitz & Partner  
Postfach 86 01 09  
D-81628 München (DE)

(56) References cited:  
FR-A- 1 369 144 GB-A- 172 171  
US-A- 2 505 426 US-A- 3 350 049  
• GB-A-M15148 (H.H.THOMPSON) 10 July 1913

EP 0 602 055 B1

Note: Within nine months from the publication of the mention of the grant of the European patent, any person may give notice to the European Patent Office of opposition to the European patent granted. Notice of opposition shall be filed in a written reasoned statement. It shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).

**Description****BUILDING STRUCTURE****FIELD OF THE INVENTION**

This invention relates to a building structure and more particularly to a decorative structural column having any desired shape or surface design, and a method of forming such a structure.

**BACKGROUND OF THE INVENTION**

Columns formed from concrete or other suitable material are commonly used in buildings and other types of structures. These columns are generally formed using some sort of form or mold into which steel reinforcing bar and concrete are inserted. After the concrete has hardened, the form is stripped away to leave a standing column.

The concrete columns so formed generally have an irregular surface finish corresponding to the interior surface of the form. It is often a labour intensive and time consuming operation to prepare and smooth the column surfaces to an aesthetically more pleasing finish. In addition, columns constructed using molds or forms tend to be limited to a constant circular or rectangular cross-section to simplify the required mold or form. Columns can be sculpted into a desired form after casting but this is an expensive and time consuming procedure that requires highly skilled craftsmen.

United States Patent 2,505,426 to O'Flaherty discloses a typical prior art concrete column molding system that uses a tarpaper form. This system is limited to essentially cylindrical columns.

United States Patent 4,606,167 to Thorne discloses a method of enclosing structural supporting columns such as I-beams within a mould to produce a rounded column. The arrangement features the use of spaced ring members that act as guides in the formation of a rounded exterior surface.

United States Patent 4,887,789 to Harris et al. discloses a mold for forming sculpted or ornate column. A mold must first be cut corresponding to the shape of the desired column and the mold must be separated from the cast column.

United States Patent 566,751 to Gilman discloses a porous substrate adapted to accept a veneer of artificial stone in order to form structural ornamental columns.

French Patent 1,369,144 discloses a structural form comprising a hollow body of a desired cross-sectional shape having a closed contour. The form comprises an internal shell or core having any desired cross-sectional shape with outer covering and reinforcing layers of resin and glass fibres. The form can be filled with concrete. The central shell or core has the same cross-sectional shape as the external form and the covering layers are

used to reinforce and strengthen inner core, therefore, each time a form with a different external appearance is required, a new internal shell must be formed.

United States Patent 3,350,049 to Reiland discloses a concrete form that uses a central core formed into the desired shape of the column to be constructed. The core is braced by an external tubular support shell and by bracing material comprising foamed plastic material injected into the spaces between the core and the support shell to prevent the core from distorting when concrete is poured into the core. The form comprising the core, the support shell and the bracing material is cut away and discarded once the concrete has set to leave a finished column.

**SUMMARY OF THE INVENTION**

There exists a need for a building structure that addresses the problems of the prior art by providing a column that can be easily formed into a desired ornamental shape in a relatively inexpensive and efficient process.

Accordingly, the present invention provides an ornamental building structure (2) comprising a tubular member (4) having a hollow interior, an exterior surface, and load bearing means (8) extending through said tubular member (4) within said hollow interior characterized by:

a substantially non-load bearing layer (6) of substantially rigid light-weight synthetic foam applied to said exterior surface and shaped to define an arbitrary ornamental exterior profile of varying radial dimension along at least part of said tubular member (4); and  
 a thin outer finishing layer (16) applied over said synthetic foam preserving said profile.

In a further aspect the present invention provides a method for forming a building structure (2) having a desired ornamental exterior profile of varying radial dimension comprising the steps of:

providing an assembly comprised of a tubular member (4) having a hollow interior and an exterior surface and a layer of non-load bearing material applied to said exterior surface (6), said layer having an initial radial thickness oversized in relation to said desired ornamental profile;  
 shaping said non-load bearing material to said desired ornamental profile having a varying final radial thickness by removing outer portions of said layer; and  
 installing said non-load bearing assembly in a building structure for covering a load bearing means (8) extending through said tubular member (4) in said hollow interior.

In the method of the present invention, urethane

foam is the is the preferred exterior covering layer and the tubular member is formed from cardboard. This arrangement provides a relatively lightweight, easily manipulated structure that can be shaped into a desired column shape on a lathe at the construction site or at a remote location. Subsequently, the formed column can be moved to the desired erection site and the reinforcing bars and concrete installed.

#### BRIEF DESCRIPTION OF THE DRAWINGS

The present invention is illustrated, merely by way of example in the accompanying drawings, in which:

Figure 1 is side elevation of a building structure according to the present invention; and

Figure 2 is a section view taken along line 2-2 of Figure 1 showing the cross-sectional arrangement of the building structure.

#### DESCRIPTION OF THE PREFERRED EMBODIMENTS

Figure 1 shows a building structure in the form of an ornate column 2 constructed according to the present invention. The internal structure of column 2 is shown in Figure 2 which represents a typical cross section through the column along the line 2-2.

The structure comprises a tubular member 4 having an applied covering layer 6 that is formed into a desired shape. In the preferred embodiment, tubular member 4 is a cardboard tube of the type that is presently used as a disposable mold for concrete columns. The cardboard tube is generally referred to in the industry as a "sono-tube". The applied covering layer is a substantially rigid light-weight synthetic foam. Preferably, applied covering layer 6 comprises urethane foam that is sprayed onto the cardboard tubular member. In forming a building structure according to the present invention, tubular member 4 can be set up in a lathe and rotated. Urethane foam is applied to the rotating tubular member to establish a rough shape that is oversize but approximates the final desired form of the building structure to be created.

Tube 4 and applied covering layer 6 provide a relatively light weight structure that is easily manipulated. While still on the lathe the covering layer can be shaped to the desired final shape and the covering surface smoothed by sanding to create an appropriate finish using conventional tools.

The combined tube and applied covering layer is then placed in position at the desired location at the construction site. Internal load bearing means in the form of reinforced concrete 8 is installed within the interior of tube 4 to create a structural member 2 with an ornate exterior of any desired shaped. Note in Figure 1 that the load bearing means preferably incorporates reinforcing bars 1 that extend into the floor and ceiling.

While the building structure of the present invention

can be formed in part at an assembly plant and the rest of the structure at the work site, as described above, it is also possible to assemble the structure entirely at a construction plant. For example, it is possible to install 5 the load bearing means when the structure is being created and transport the completed structure to the work site.

As an example, the column of Figure 1 has had its applied covering layer 6 sculpted into a column having an ornate base 12, a tapering shaft 13 and an ornate top 14. The sculpted applied covering layer has no real load bearing capabilities and any load is supported by internal concrete shaft 8 within cardboard tubular member 4 shown by dashed lines.

It is intended that additional layers can be applied to the foam covering layer to strengthen, waterproof or alter the appearance of the structure.

A fabric or resin layer 16 can be applied to the outer surface of the sculpted covering layer 6 to strengthen 20 the urethane foam and provide desired rigidity.

A resin layer will tend to impregnate and saturate the porous foam surface. Preferably, the resin is pigmented to suit the base colour of the desired finishing layer.

If a resin layer is used, sand, aggregate, copper or tile can be applied to the resin layer to create a textured finish.

A paint finish 18 can also be applied to the exterior of the structure to give the appearance of a textured finish. A "faux" paint finish can be used to create the appearance of marble, granite or other faux finishes.

A final transparent clear coat 20 can be applied as a protective coat and also a weatherproof finish.

The building structure of the present invention is 35 also intended for retrofitting to existing structural columns. A tubular member of appropriate dimensions to surround the existing column is selected and a covering layer is applied and shaped as previously described. The tubular form is then cut in half longitudinally before 40 the final finishing layers are applied. The tubular form halves are fitted over the existing structural columns and glued together along their seams. Final finishing can then be applied.

The present invention provides a relatively inexpensive and easily formed building structure that is easily handled and is aesthetically pleasing to the eye. While polyurethane foam has been specifically mentioned as a preferred covering layer, it will be appreciated that other types of plastic foam material can also be used.

Although the present invention has been described in some detail by way of example for purposes of clarity and understanding, it will be apparent that certain changes and modifications may be practised within the scope of the appended claims.

**Claims**

1. An ornamental building structure (2) comprising a tubular member (4) having a hollow interior, an exterior surface, and load bearing means (8) extending through said tubular member (4) within said hollow interior characterized by:
- a substantially non-load bearing layer (6) of substantially rigid light-weight synthetic foam applied to said exterior surface and shaped to define an arbitrary ornamental exterior profile of varying radial dimension along at least part of said tubular member (4); and
- a thin outer finishing layer (16) applied over said synthetic foam preserving said profile.
2. A building structure as claimed in claim 1 in which said non-load bearing layer (6) is formed from urethane foam.
3. A building structure as claimed in claim 1 in which said tubular member (4) comprises a cardboard tube.
4. A building structure as claimed in claim 1 in which said load bearing means (8) comprises reinforced concrete.
5. A building structure as claimed in claim 1 in which said thin outer finishing layer (16) comprises a fabric layer.
6. A building structure as claimed in claim 1 in which said thin outer finishing layer (16) comprises a resin layer.
7. A building structure as claimed in claim 6 in which said resin layer (16) is pigmented to match the colour of the desired exterior finish.
8. A building structure as claimed in claim 1 including a faux paint finish (18).
9. A building structure as claimed in claim 1 including a resin layer (16) having adhered to it a surface finish material.
10. A building structure as claimed in claim 9 in which the surface finish material is selected from the group consisting of sand, aggregate, copper and tiles.
11. A method for forming a building structure (2) having a desired ornamental exterior profile of varying radial dimension comprising the steps of:
- providing an assembly comprised of a tubular member (4) having a hollow interior and an exterior surface and a layer of non-load bearing material applied to said exterior surface (6), said layer having an initial radial thickness oversized in relation to said desired ornamental profile;
- shaping said non-load bearing material to said desired ornamental profile having a varying final radial thickness by removing outer portions of said layer; and
- installing said non-load bearing assembly in a building structure for covering a load bearing means (8) extending through said tubular member (4) in said hollow interior.
12. The method of claim 11 further comprising the step of applying a finishing treatment over said layer (6) preserving said ornamental profile.
13. The method of claim 11 wherein said step of installing comprises pouring concrete into said hollow interior to make said load bearing means (8).
14. A method as claimed in claim 11 in which shaping said non-load bearing assembly to said desired ornamental profile comprises rotating the tubular member (4) and applied layer (6) on a lathe and carving and sanding said layer (6) to the desired profile.

**Patentansprüche**

1. Verzierende Baukonstruktion (2), umfassend ein rohrförmiges Element (4) mit einem hohlen Innenraum, einer Außenseite und einer lastaufnehmenden Einrichtung (8), die durch das rohrförmige Element (4) in dem hohlen Innenraum verläuft, gekennzeichnet durch:
- eine im wesentlichen keine Last aufnehmende Schicht (6) aus im wesentlichen festem, leichtem synthetischem Schaumstoff, der auf die Außenseite aufgebracht und so geformt ist, daß er ein beliebiges verzierendes Außenprofil mit veränderlicher radialer Abmessung längs von mindestens einem Teil des rohrförmigen Elementes (4) bildet, und
- eine dünne äußere Abschlußschicht (16), die auf die Schicht aus synthetischen Schaumstoff aufgebracht ist und das Profil schützt.
2. Baukonstruktion nach Anspruch 1, in der die keine Last aufnehmende Schicht (6) aus Urethanschaumstoff besteht.

3. Baukonstruktion nach Anspruch 1, in der das rohrförmige Element (4) aus einem Papprohr besteht.
4. Baukonstruktion nach Anspruch 1, in der die lastaufnehmende Einrichtung (8) aus Stahlbeton besteht.
5. Baukonstruktion nach Anspruch 1, in der die dünne äußere Abschlußschicht (16) eine Stoffschicht ist.
6. Baukonstruktion nach Anspruch 1, in der die dünne äußere Abschlußschicht (16) eine Harzschicht ist.
7. Baukonstruktion nach Anspruch 6, in der die Harzschicht (16) so pigmentiert ist, daß sie mit der Farbe der gewünschten äußeren Abschlußschicht zusammenpaßt.
8. Baukonstruktion nach Anspruch 1, die eine unechten Farbanstrich (18) aufweist.
9. Baukonstruktion nach Anspruch 1, die eine Harzschicht (16) aufweist, auf die ein Oberflächenabschlußmaterial aufgebracht ist.
10. Baukonstruktion nach Anspruch 9, in der das Material für die Oberflächenabschlußschicht ausgewählt ist aus der Gruppe umfassend Sand, Zuschlagsstoffe, Kupfer und Fliesen.
11. Verfahren zur Herstellung einer Baukonstruktion (2) mit einem gewünschten verzierenden Außenprofil mit veränderlicher radialer Abmessung, umfassend folgende Schritte:
- Bereitstellung einer Anordnung, bestehend aus einem rohrförmigen Element (4) mit einem hohlen Innenraum und einer Außenseite und aus einer Schicht aus keinem Last aufnehmendem Material, das auf die Außenfläche (6) aufgebracht wird, wobei die Schicht eine radiale Anfangsdicke aufweist, die im Verhältnis zu dem gewünschten verzierenden Profil überdimensioniert ist;  
 Forming des keine Last aufnehmenden Materials zu dem gewünschten verzierenden Profil mit einer veränderlichen radialen Dicke durch das Abnehmen äußerer Bereiche von der Schicht; und  
 Einbringung der keine Last aufnehmenden Anordnung in eine Baukonstruktion zum Abdecken einer durch das rohrförmige Element (4) in dem hohlen Innenraum verlaufenden lastaufnehmenden Einrichtung (8).
12. Verfahren nach Anspruch 11, des weiteren umfassend den Schritt des Aufbringens einer Abschlußbehandlungsschicht auf die Schicht (6), die das verzierende Profil schützt.
13. Verfahren nach Anspruch 11, worin der Schritt der Einbringung das Vergießen von Beton in den hohlen Innenraum umfaßt, um die lastaufnehmende Einrichtung (8) herzustellen.
14. Verfahren nach Anspruch 11, worin die Formung der keine Last aufnehmenden Anordnung zu dem gewünschten verzierenden Profil das Drehen des rohrförmigen Elementes (4) und der aufgebrachten Schicht (6) auf einer Drehmaschine und das Einschneiden und Sandabstrahlen der Schicht (6) bis zu dem gewünschten Profil umfaßt.

#### Revendications

1. Structure de construction décorative (2) comprenant un élément tubulaire (4) comportant une partie intérieure creuse, une surface extérieure et un moyen porteur (8) s'étendant à travers ledit élément tubulaire (4), dans ladite partie intérieure creuse, caractérisée en ce que :
- une couche (6) essentiellement non porteuse constituée d'une mousse synthétique légère sensiblement rigide est appliquée sur ladite surface extérieure et est conformée de façon à définir un profil extérieur décoratif arbitraire de dimensions radiales variables le long d'au moins une partie de l'élément tubulaire (4), et une mince couche de finition extérieure (16) est appliquée sur ladite mousse synthétique afin de protéger ledit profil.
2. Structure de construction selon la revendication 1, dans laquelle ladite couche non porteuse (6) est constituée d'une mousse d'uréthane.
3. Structure de construction selon la revendication 1, dans laquelle ledit élément tubulaire (4) comprend un tube en carton.
4. Structure de construction selon la revendication 1 dans laquelle ledit moyen porteur (8) comprend du béton armé.
5. Structure de construction selon la revendication 1, dans laquelle ladite mince couche de finition extérieure (16) comprend une couche de tissu.
6. Structure de construction selon la revendication 1, dans laquelle ladite mince couche de finition extérieure (16) comprend une couche de résine.
7. Structure de construction selon la revendication 6, dans laquelle ladite couche de résine (16) est pig-

- mentée pour correspondre à la couleur de la finition extérieure désirée.
8. Structure de construction selon la revendication 1, comprenant une peinture de finition (18) imitant une autre matière. 5
9. Structure de construction selon la revendication 1, comprenant une couche de résine (16) sur laquelle est collé un matériau de finition de surface. 10
10. Structure de construction selon la revendication 9, dans laquelle le matériau de finition de surface est sélectionné dans un groupe composé de sable, granulat, cuivre et tuiles. 15
11. Procédé destiné à former une structure de construction (2) ayant un profil extérieur décoratif désiré de dimensions radiales variables, comprenant les étapes suivantes : 20
- fourniture d'un ensemble constitué d'un élément tubulaire (4) ayant une partie intérieure creuse et une surface extérieure, et d'une couche (6) constituée de matériau non porteur appliquée sur ladite surface extérieure, ladite couche ayant une épaisseur radiale initiale surdimensionnée par rapport audit profil décoratif désiré ; 25
- modelage dudit matériau non porteur jusqu'audit profil décoratif désiré ayant une épaisseur radiale finale variable, en enlevant des parties extérieures de ladite couche ; et 30
- installation dudit ensemble non porteur dans une structure de construction destinée à couvrir un moyen porteur (8) s'étendant à travers ledit élément tubulaire (4) dans ladite partie intérieure creuse. 35
12. Procédé selon la revendication 11, comprenant en outre l'étape d'application d'un traitement de finition sur ladite couche (6) afin de protéger ledit profil décoratif. 40
13. Procédé selon la revendication 11, dans lequel ladite étape d'installation comprend le versement de béton dans ladite partie intérieure creuse afin de constituer ledit moyen porteur (8). 45
14. Procédé selon la revendication 11, dans lequel le modelage dudit ensemble non porteur jusqu'audit profil décoratif désiré comprend le tournage de l'élément tubulaire (4) et de la couche appliquée (6) sur un tour, et la sculpture et le ponçage de ladite couche (6) jusqu'au profil désiré. 50
- 55

Fig. 1.

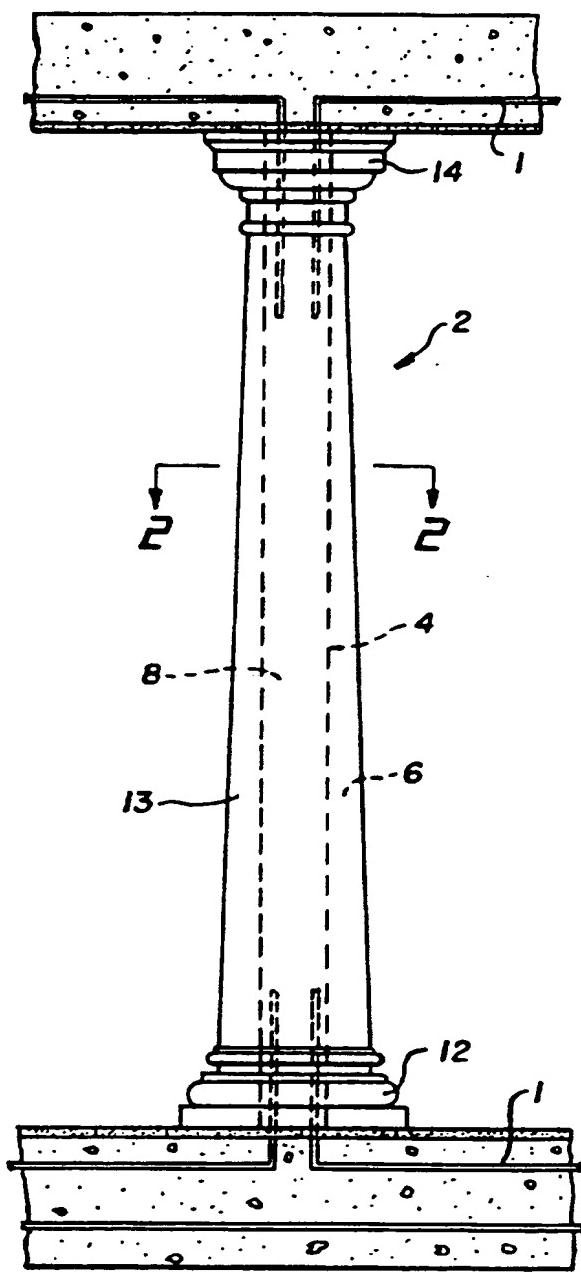


Fig. 2.

